Web Science, Artificial Intelligence and Intelligence Augmentation (in Dagstuhl Perspectives Workshop 18262 - 10 Years of Web Science: Closing The Loop)

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3.8 Web Science, Artificial Intelligence and Intelligence Augmentation

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Abstract

This abstract paper summarizes some challenges and opportunities at the intersection of Web Science, Artificial Intelligence and Intelligence Augmentation.

Seminar 25.–29. June, 2018 – http://www.dagstuhl.de/18262
1998 ACM Subject Classification to be updated B.3.3 Performance Analysis and Design Aids, B.5.1 Design, C.1.2 Multiple Data Stream Architectures (Multiprocessors), D.1.3 Concurrent Programming
Keywords and phrases Dagstuhl Report, Web Science, Dagstuhl Perspectives Workshop
Digital Object Identifier 10.4230/DagRep.1.1.1

3.8.1 Intelligent approaches to follow and support Web evolution

Initially, the Web was essentially perceived as a huge distributed library of linked pages, a worldwide documentary space for humans. In the mid-90s, with wikis and forums, the Web was re-opened in read-write mode and this paved the way to numerous new social media applications. The Web is now a space where three billion users interact with billions of pages and numerous software. In parallel, extensions of the Web were developed and deployed to make it more and more machine friendly supporting the publication and consumption by software agents of worldwide linked data published on a semantic Web. As a result of all its evolutions, the Web became a collaborative space for natural and artificial intelligence. This raises the problem of supporting these worldwide interactions and forming these hybrid communities. In my talk I presented some of the opportunities and challenges for Web Science in building this evolution of a Web toward a universal space linking all kinds of intelligence.

3.8.2 AI in classical tasks and problems of the Web

A first set of challenges can be directly identified from the classical tasks and problems we encounter on the Web e.g. help us search, browse, contribute, etc. The Web already is populated by Web bots but they usually are restricted to certain realms while they could be generalized. For instance we could generalize the bots as the ones of Wikipedia to bots on the open Web designed to monitor and preserve certain characteristics of the Web. We could imagine Web farms for Web AIs hosting autonomous agent that would study, monitor and report on the Web. Problems that could be targeted by these Web bots include: the detection of metrics manipulation, cross-language plagiarisms, centralization or digital divide; the prevention of vandalism or spamming; the generation of links, back links, navigational content beyond search results; etc. These agents would be based on policies and values important to the philosophy of the Web (e.g. seek decentralization, equality of access) to improve its resilience and quality.

3.8.3 The special relation of AI and data(sets) on the Web

The open and linked data facet of the Web is a special case of particular importance when considering the links between AI and Web (science) data (science). Artificial Intelligence can be used to assist Web Scientists and vice-versa. Intelligent agent can help us produce, curate, share and maintain corpora and datasets. For instance AI techniques could be designed to check the quality of a dataset and look for bias in it. Inversely, Web Science could produce multidisciplinary methods and tools to certify the quality and characterize training sets to improve the quality of the learning and conclusion made by AIs using them.

3.8.4 Benevolent AIs for a resilient Web

The two previous ideas could be generalized to the goal of designing benevolent AIs for the Web. Web agents working to improve users' experience, understanding, awareness and control of their participation and contributions to the Web. For instance, educational AI could help educate Web users in many domains including Web literacy or ethical thinking. Agents could also provide customized descriptions of the context in which a user is, including security, neutrality and privacy notices or his human-computing participation when it occurs. AI could also help users burst our filter bubbles and foster serendipity. On the longer term, benevolent AIs could actively help enforce (human) rights on the Web and be scrutiny agents for important values of the Web.

3.8.5 AI to help us humans scale and face humanity on the Web

With the advent of the Web, human individuals also face humanity in all its scale and diversity. Web scientists could design AIs to help humans face humanity on the Web and help us scale to the world-wide web scale. These goal-driven agents could actively participate to the online activity and, for instance, foster linkage, interactions and convergence, bridge, translate, check, or augment our posts and maintain for us an overview of our social context and activity. They could also prevent or report problems such as bullying, harassment and polarization.

3.8.6 A variety of AIs to absorb the varieties of the Web

The force of these AIs could also be in their multiplicity and interactions. The law of requisite variety of W.R. Ashby says that "variety absorbs variety" and in our case a diversity of AIs could be a good way to address the many types of diversity we find of the Web (content, users, contexts, tasks, usages, resources, etc.). In fact more than AI, it is maybe distributed AI that has a rendezvous with the Web and its sciences [6]. Multi-agent systems and distributed AI blackboards are examples of distributed AI architectures which, if merged with the Web architecture would allow for many different kinds of AIs to collaborate worldwide to the benefit of the Web. The AIs and the multi-agent systems would also in return benefit from the Web, its resources and its methods. Following the wiki-way, AIs could be created, edited, crossed, and bred on the Web, socially maintained, copied and versioned: the Web way applied to AI with, for instance, "copy-paste-customize" based contribution to the population of agents. For this to happen, and just as it was the case for the Web, we would need a public domain Web-based AI architecture.

3.8.7 Explore and expand all the forms of intelligence on the Web

The multidisciplinary nature of Web Science also puts it in an ideal position to explore and expand the forms of intelligence on the Web. First, both Web Science and AI are highly multidisciplinary [5] and the multiple disciplines that are common to both fields are as many bridges to make them interact. AI could also be used to operationalize the expertise from each domain into agents that help us providing assistance, reporting or training from the domains they represent. These agents could help us find and support a massively multidisciplinary method and allow us to scale to the multi-disciplinary interactions required by the design and study of the Web. One possibility, for instance, would be for these AIs to produce and maintain boundary artifacts at the frontiers of disciplines. The multidisciplinary domains of Web Science could also be leveraged to identify other ways of simulating, reproducing or engaging intelligence including emotional intelligence, communication skills, imagination, etc.

3.8.8 Studying and building the hybrid societies of the Web

Such an evolution as the one described in the previous sections would finally lead Web Science to consider the challenge of studying and designing hybrid societies of natural intelligence and artificial intelligence on the Web. This study would have to include different forms of natural intelligence (e.g. people, connected animals, connected plants) and different forms of artificial intelligence (reasoning, learning, inducing, etc.). The challenge will also be to study their interactions with the resources of the Web (linked pages, linked data, connected objects, etc.) forming the environment of these forms of intelligences. Web Science will have to face the problem of this massive interaction design with the Web and everything it links [7] and AI will have to face the problem of engaging in very different types of interactions with different forms of intelligence including different kinds of AIs [4]. Studying and designing these hybrid societies, from swarms to complex societies with their normative rules, their social constructs, their governance, etc. will be a highly challenging and multidisciplinary task.

3.8.9 Towards a Web linking all forms of intelligence

In Web Science, we should build our research program as a joint effort between Web Science and two research fields born in the 50s: "AI" for Artificial Intelligence [2] and "IA"for Intelligence Amplification [3] and Intelligence Augmentation [1].

To conclude this abstract in one sentence, I would say that a Web Science research agenda must account for the fact that the long term potential of the Web is to augment and link all forms of intelligence.

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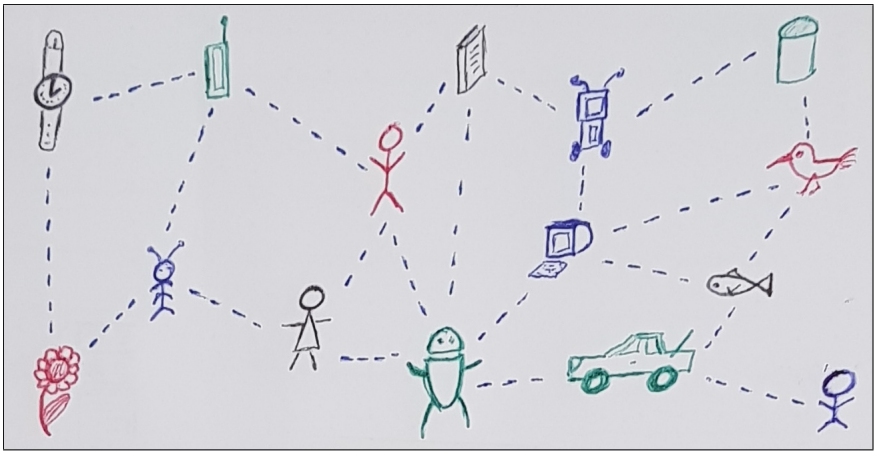

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